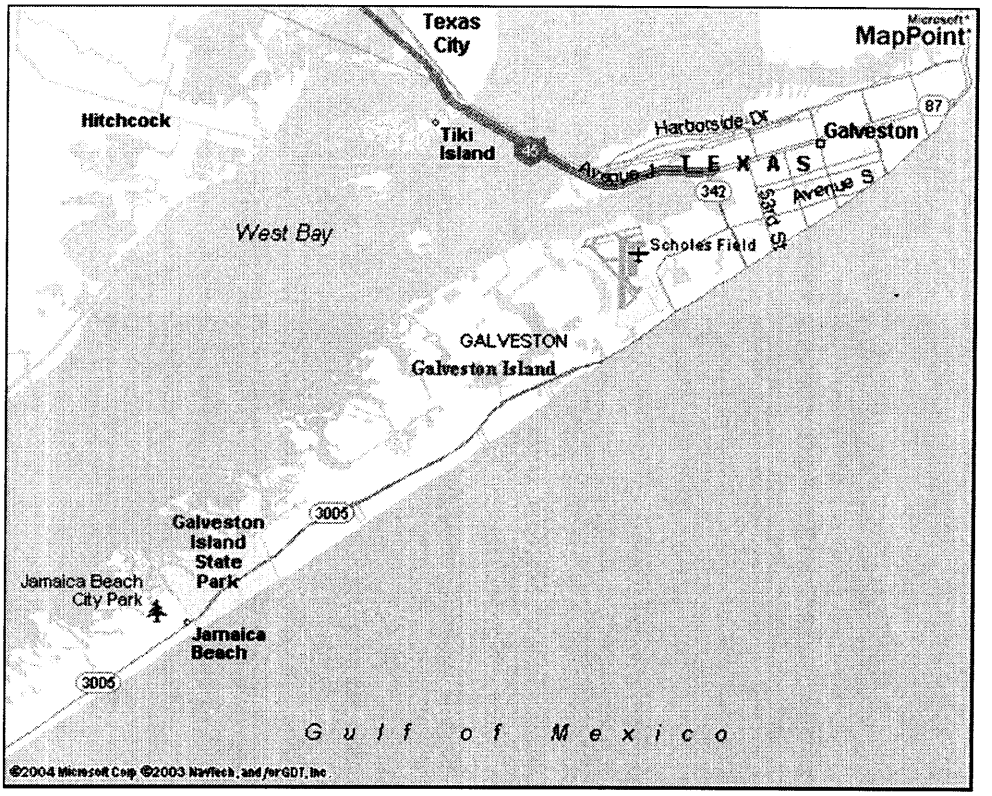

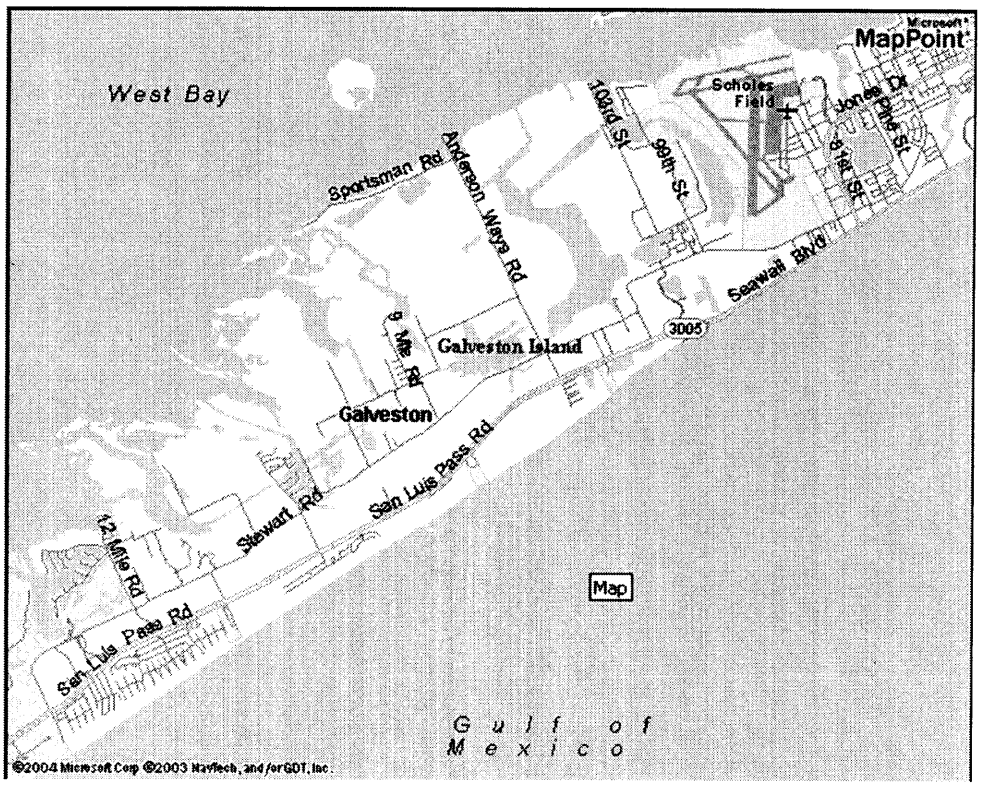

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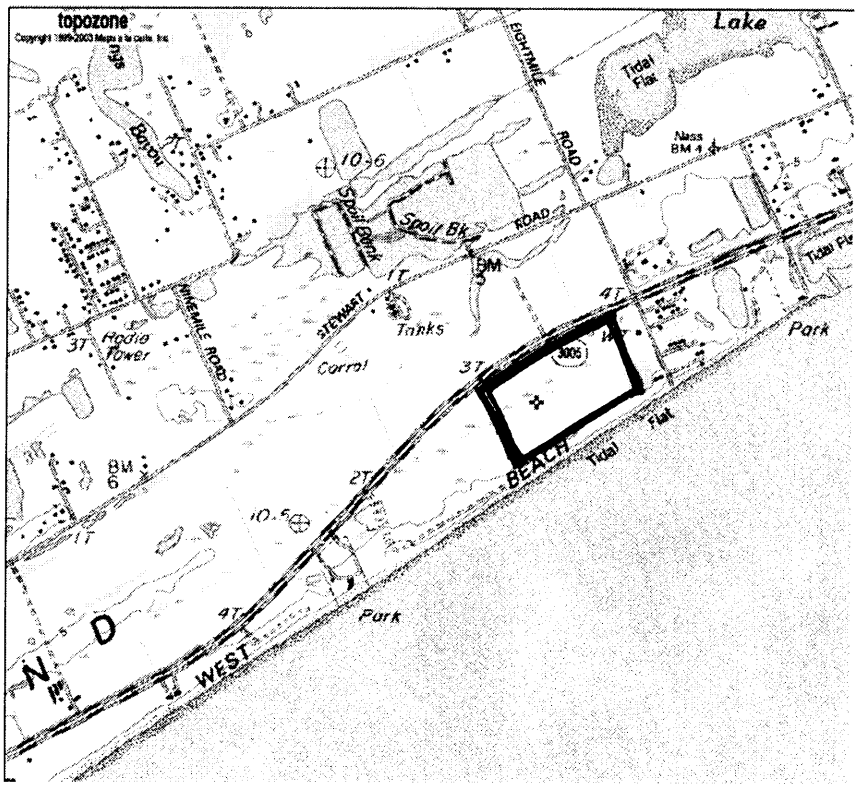

23282 Project Site – Kahala Development LLC
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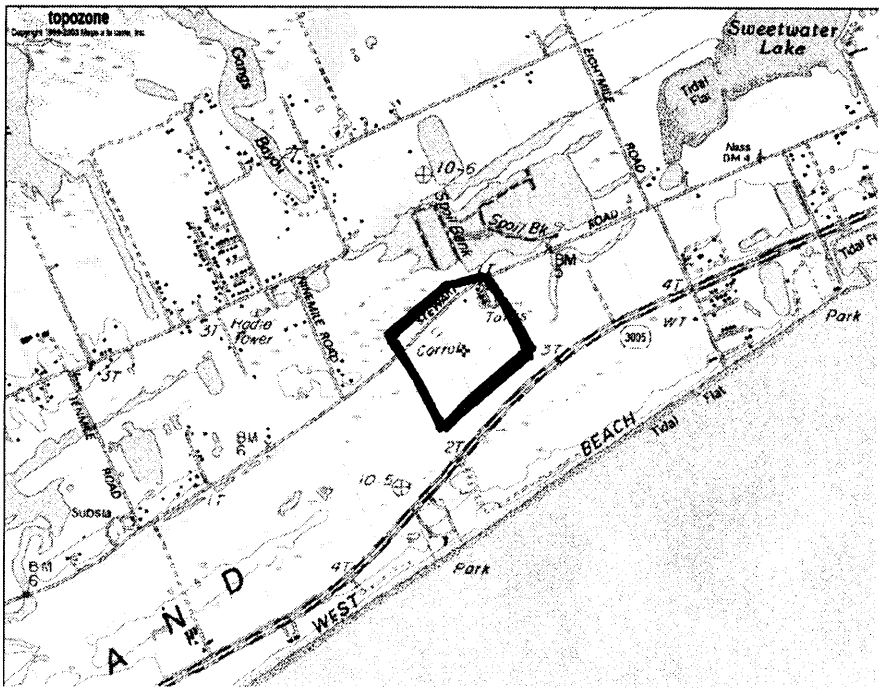
USGS **Lake Como** Quad



23282 Mitigation Site – Kahala Development LLC
UTM 15 315867E 3235325N (NAD 27)
USGS **Lake Como** Quad

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SWCA
ENVIRONMENTAL CONSULTANTS

Kahala Project Site
Vicinity Map
Galveston County, Texas Figure 1

Project Site
(~78.68 ac.)

Background: Galveston Island
Color Infrared From GLO (2002)
0 1,000 2,000 Feet

N

Map Produced December 22, 2003
Project #: 6357-015

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Wetland Acreages (Verified Delineation)	
Total Acreage	Impacted Acreage
Wet 1 - 0.432 ac.	Wet 1 - 0.037 ac.
Wet 2 - 0.031 ac.	Wet 2 - 0.031 ac.
Wet 3 - 6.515 ac.	Wet 3 - 6.515 ac.
6.978 ac.	6.583 ac.

PHASE 1

VERIFIED BY USACE (SD-19079(03))

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Wetland Acreages (Estimated)	
Total Acreage	**Impacted Acreage**
Wet 4 – 7.511 ac. (est)	Wet 4 – 6.637 ac. (est)
Wet 5 – 9.425 ac. (est)	Wet 5 – 9.425 ac. (est)
Wet 6 – 0.038 ac. (est)	Wet 6 – 0.024 ac. (est)
Wet 7 – 0.170 ac. (est)	Wet 7 – 0.170 ac. (est)
17.144 ac. (est)	16.256 ac. (est)

PHASE 2

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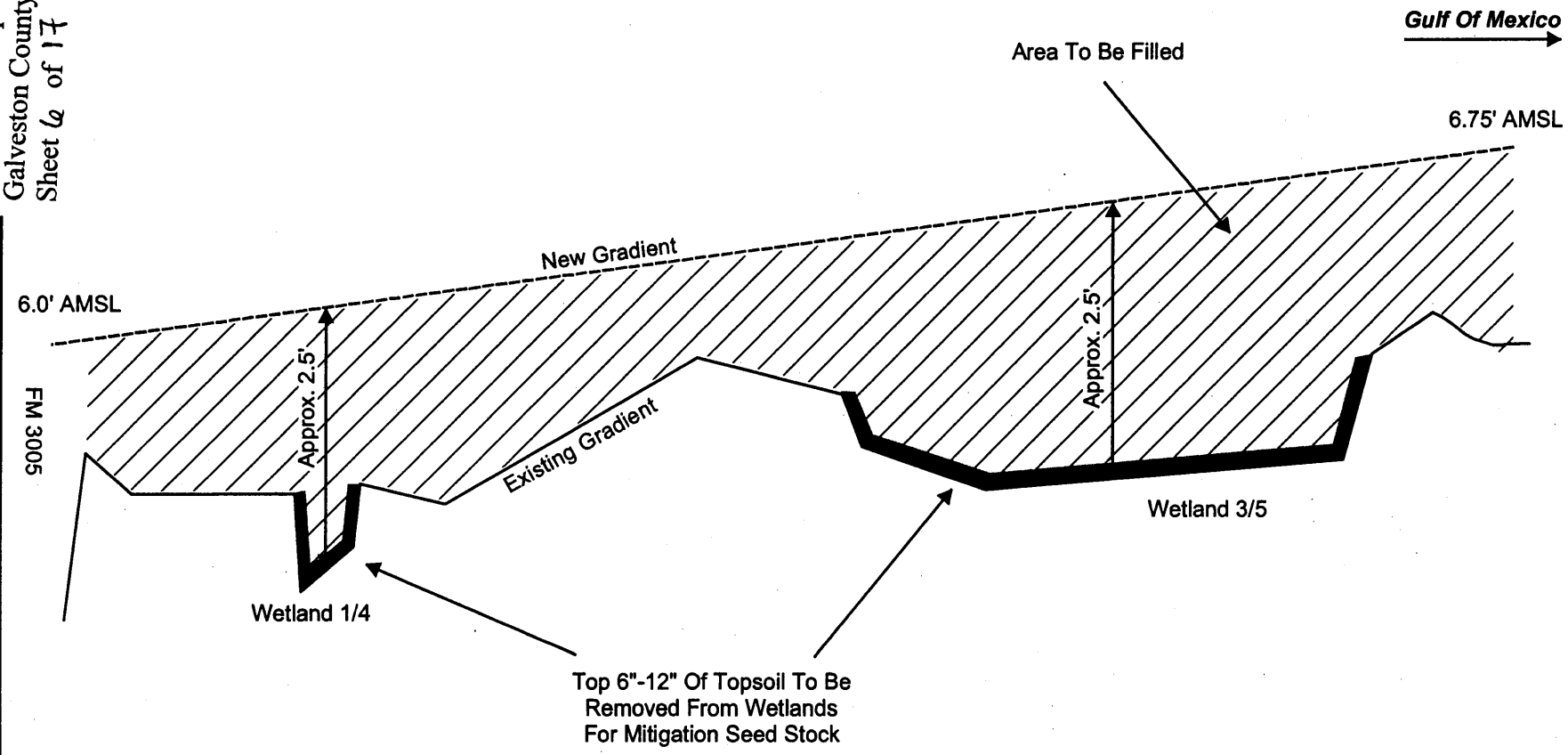

Wetland Mitigation Plans

The proposed mitigation site has suffered hydrologic alteration from ditching and highway construction as well as plant community degradation via grazing. The proposed plan would restore a variety of plant community types including open water and palustrine emergent wetland, prairie/grassland and scrub/shrub. Birding trails would be included in the plan to support passive recreation and wildlife viewing for tourists at nearby resorts.

The proposed mitigation project is intended to fit into a larger conceptual plan for coastal wetland habitat creation. This mitigation project is intended to function as an incubator for additional private enterprise restoration and birding projects along this portion of the Gulf Coast. It is hoped that this project will eventually be linked with a series of regional paths connecting similar habitat preservation and creation projects.

Topographic survey information will be required to create appropriate water level elevations in the restored wetland.

Concept Plan 1 - This proposed mitigation plan involves the creation of approximately 24 acres of freshwater emergent vegetation with grassland fringe bordered by 17 acres of restored and created upland sand/dune communities. Several large cells would be excavated and connected to the existing slough via overflow channels. The proposal would establish a flow-through system, simulating the natural hydrologic flow of the slough. Wetland enhancements would occur throughout the approximately 11.5 acres of existing wetland in the form of removal of invasive species, particularly French Tamarisk (*Tamarix gallica*) and replanting with native plant species (see species list, page 12).

In line with this general purpose, the proposed mitigation plan for the Kahala site involves the creation of visitor services to include a parking area for up to ten automobiles, information kiosks on the north and south pedestrian entrances, observation decks (both elevated and at water level), as well as a shrub sheltered path for wildlife observation. These features have been proposed along the western margin of the site in order to minimize intrusion by visitors. The eastern portion of the site is proposed to provide a large area of core habitat for wildlife communities. Islands would provide refuge for nesting shorebird species, isolated from domestic cat and dog predators.

Concept Plan 1 proposes somewhat less wetland mitigation in exchange for potential educational and promotional value of visitor services in creating an improved climate for wetland creation, mitigation and as an incubator for future restoration projects throughout the region.

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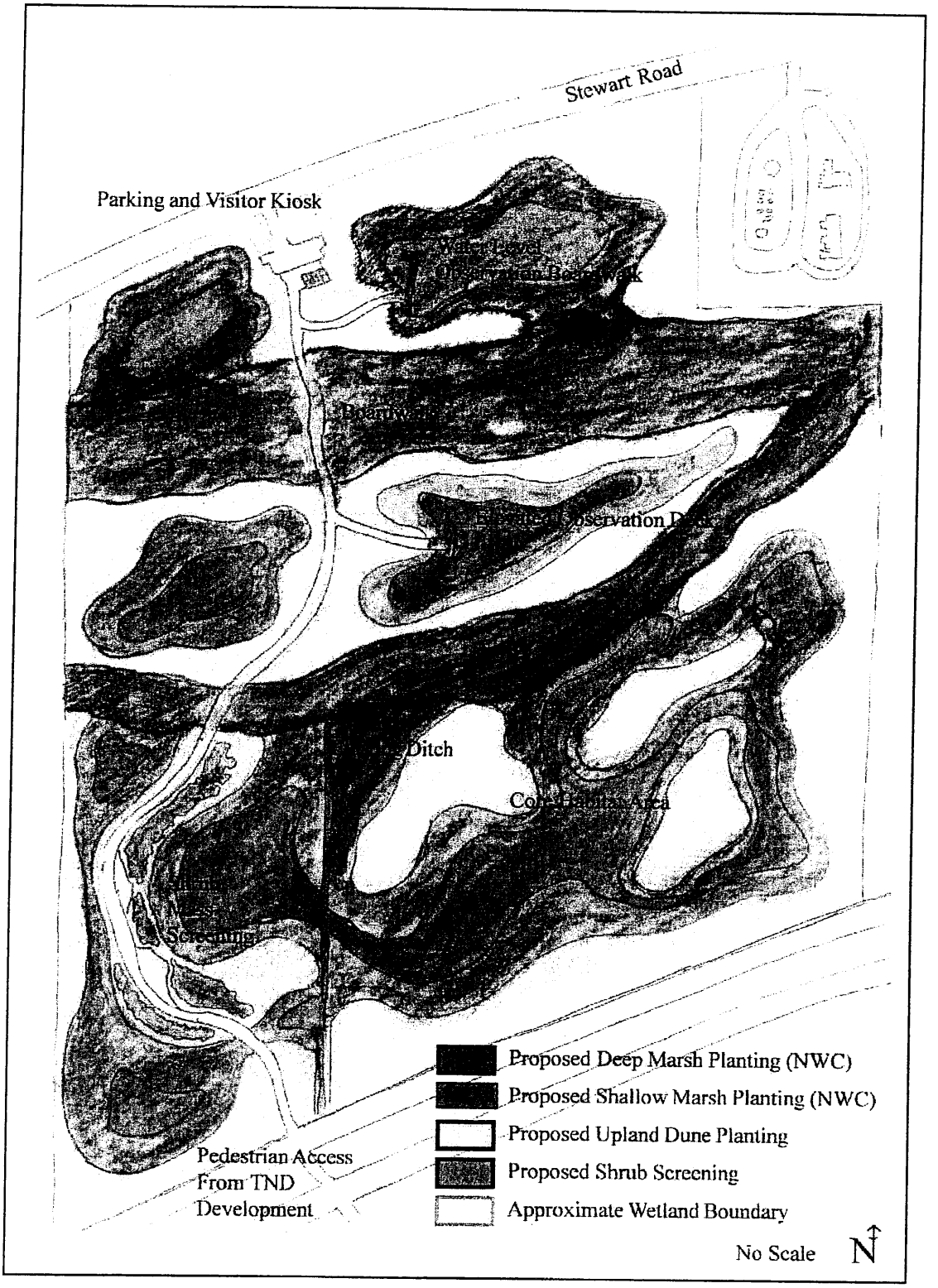

Figure 3: Concept Plan 1

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Concept Plan 2 – This proposed plan is intended to create linear wetland features approximating the linear swale type shallow wetlands being impacted by the proposed TND project.

The proposed conceptual mitigation plan involves the creation of approximately 25-30 acres of freshwater emergent vegetation with restoration and creation of grassland fringe occurring along the dunes separating the wet swale areas. The proposal would seek to achieve a groundwater driven hydrology system by excavating to one foot below the normal groundwater level within the wetland cells. Upland ridges separating wet swales would rise gradually to approximately one foot above the normal groundwater level. Wet swales would range in width from 20 to 100 feet across with most averaging 50 feet across. Upland ridges would range from 20-40 feet across separating wetland cells. Wetland enhancements would occur throughout the approximately 11.5 acres of existing wetland in the form of removal of invasive species, particularly French Tamarisk (*Tamarix gallica*) and replanting with native plant species (see species list, page 12).

This proposed concept plan would create a deep trench surrounding the entire site to prevent the free flow of predatory animals (domestic cats and dogs, alligators and raccoons. A submerged chain link fence with a non-perch top would be installed along the centerline of the trench to prevent swimming predators from entering the site. The top of the fence is to be installed to two feet above the assumed normal high water level. The non-perch top is intended to discourage predatory birds from taking advantage of a hunting perch that could potentially be provided by a normal chain link fence.

This plan would provide minimal visitor services at a northern parking area along Stewart Road and a southern pullout from FM 3005. Visitor services would be limited to an information kiosk at the northern parking area and a small observation platform located at each pullout.

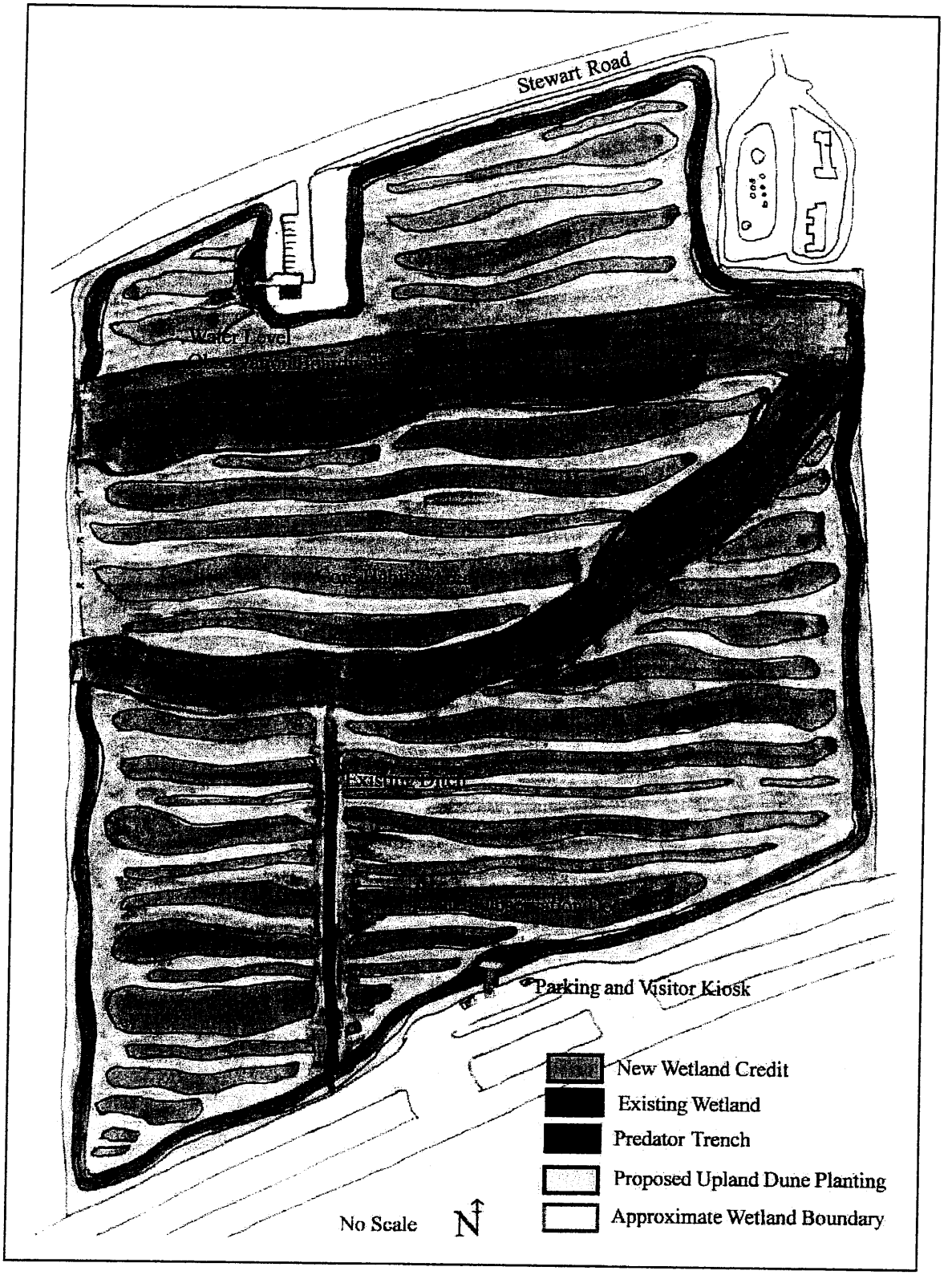

Figure 4: Concept Plan 2

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Concept Plan 3 – This proposed plan is intended to create linear wetland features approximating the linear swale type shallow wetlands being impacted by the proposed TND project. This concept uses the same general approach as Concept Plan 2 with modifications primarily associated with educational and passive recreational use. The plan is intended to function as a part of existing and potential expansion of birding activities along the Galveston shore.

The proposed conceptual mitigation plan involves the creation of approximately 25 acres of freshwater emergent vegetation with approximately 16 acres of grassland fringe to occur along the upper dunes separating the wet swale areas. The proposal would seek to achieve a groundwater driven hydrology system by excavating to one foot below the normal groundwater level within the wetland cells. Upland ridges separating wet swales would rise gradually to approximately one foot above the normal groundwater level. Wet swales would range in width from 20 to 100 feet across with most averaging 50 feet across. Upland ridges would range from 20-40 feet across separating wetland cells. Wetland enhancements would occur throughout the approximately 11.5 acres of existing wetland in the form of removal of invasive species, particularly French Tamarisk (*Tamarix gallica*) and replanting with native plant species (see species list, page 12).

This proposed concept plan would create a deep trench surrounding the entire site to prevent the free flow of predatory animals (domestic cats and dogs, alligators and raccoons. A submerged chainlink fence with a non-perch top would be installed along the centerline of the trench to prevent swimming predators from entering the site. The top of the fence is to be installed to two feet above the assumed normal high water level. The non-perch top is intended to discourage predatory birds from taking advantage of a hunting perch that could potentially be provided by a normal chainlink fence.

Visitor services associated with this plan include interpretive trails, viewing blinds, one elevated observation deck and one water level observation area, as well as a shrub sheltered path for wildlife viewing at optimal locations. Shrub sheltered paths would provide viewing with minimal disturbance to wildlife. Kiosks would be located at each of the two pullouts providing information on Texas shorebirds, coastal wetlands and the value of wetland preservation. Concept Plan 3 proposes somewhat less wetland mitigation in exchange for potential educational and promotional value of visitor services in creating an improved climate for wetland creation, mitigation and as an incubator for future restoration in the area. See Figures 6 through 9 for conceptual drawings of these proposed features.

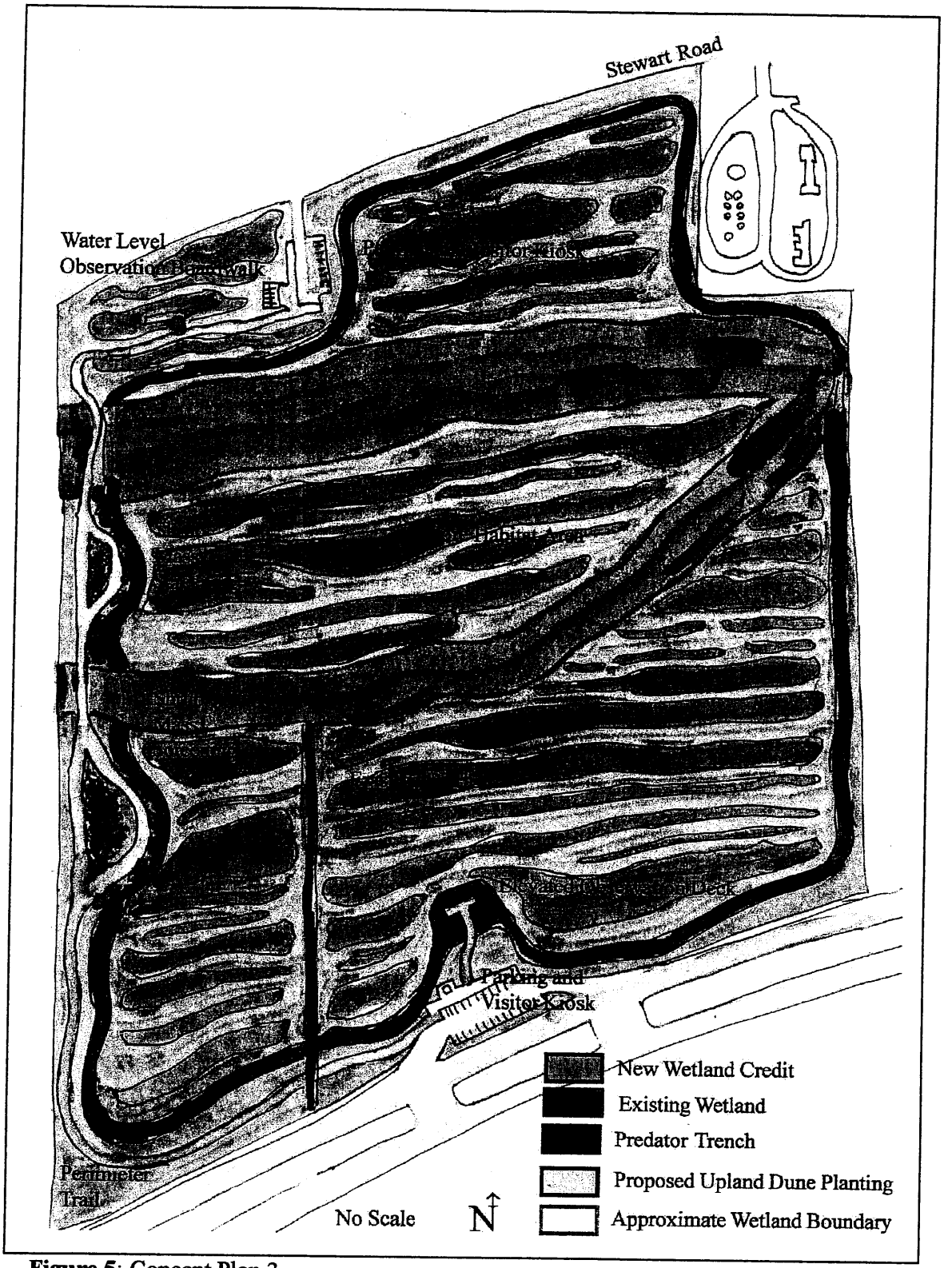

Figure 5: Concept Plan 3

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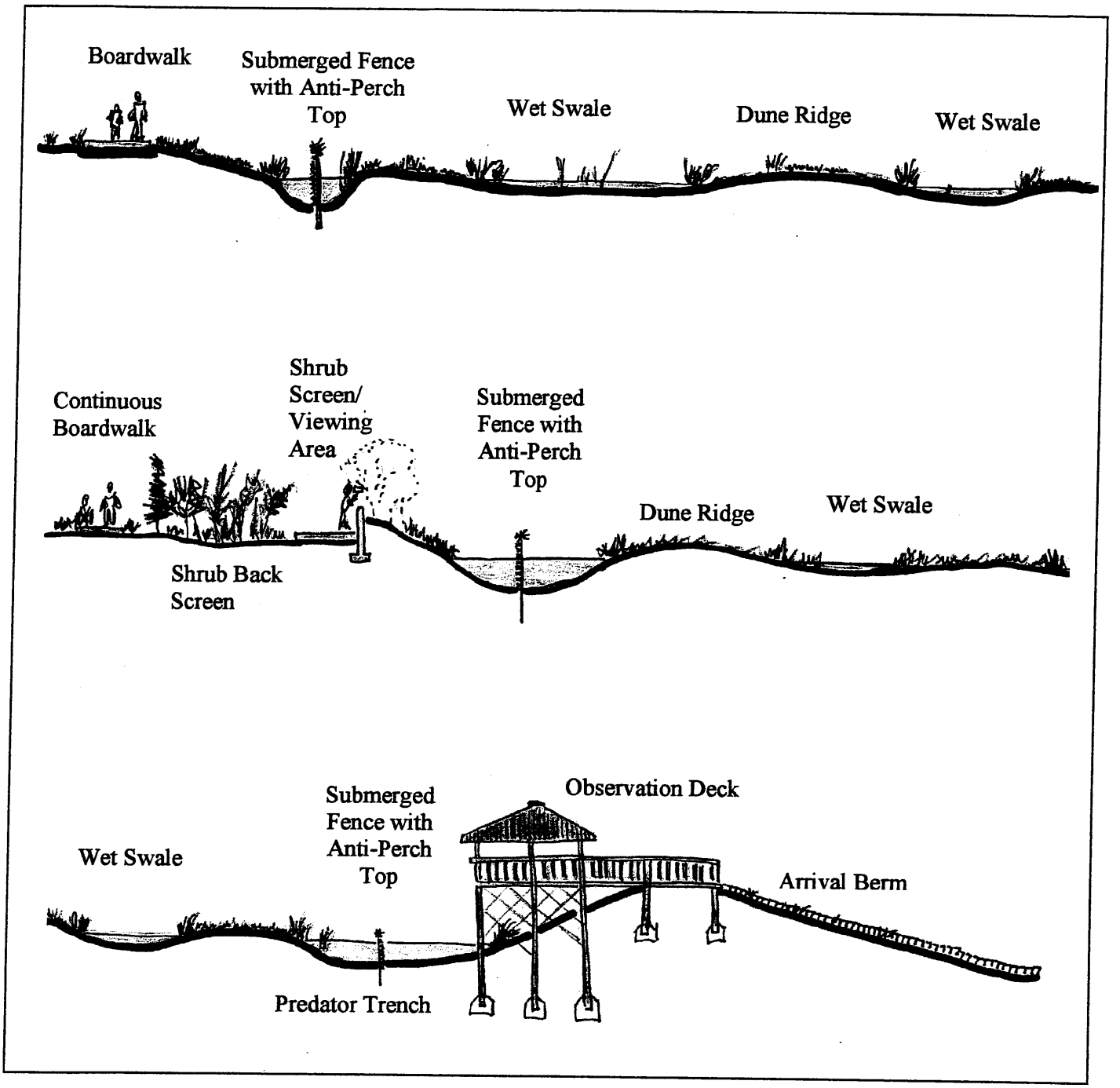

Figure 6: Typical Sections for Concept Plans 2 and 3

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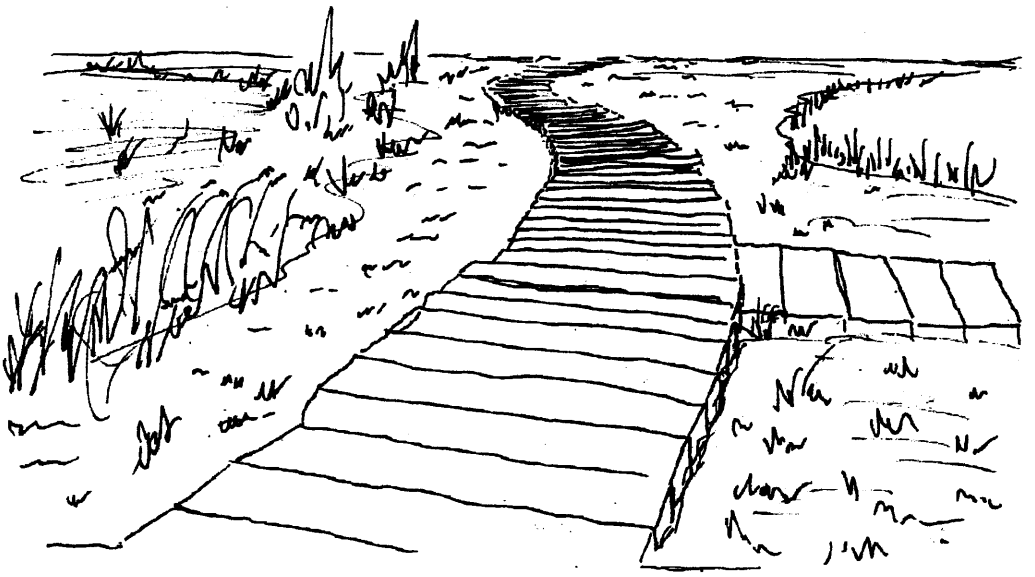
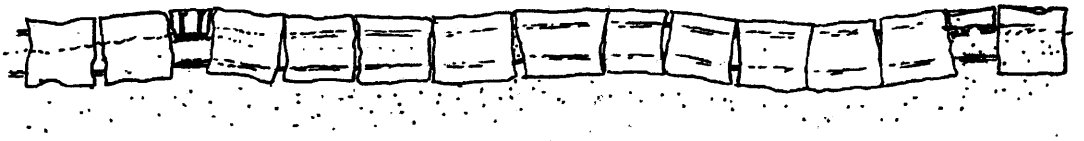


Boardwalk Concept Perspective

Boardwalk Members to be constructed of reused large squared timbers

Boardwalks float on finished sand grade

Timbers to be connected tight by Class C Zinc coated steel cable



Boardwalk Concept Section

Figure 7: Boardwalk Construction Concept

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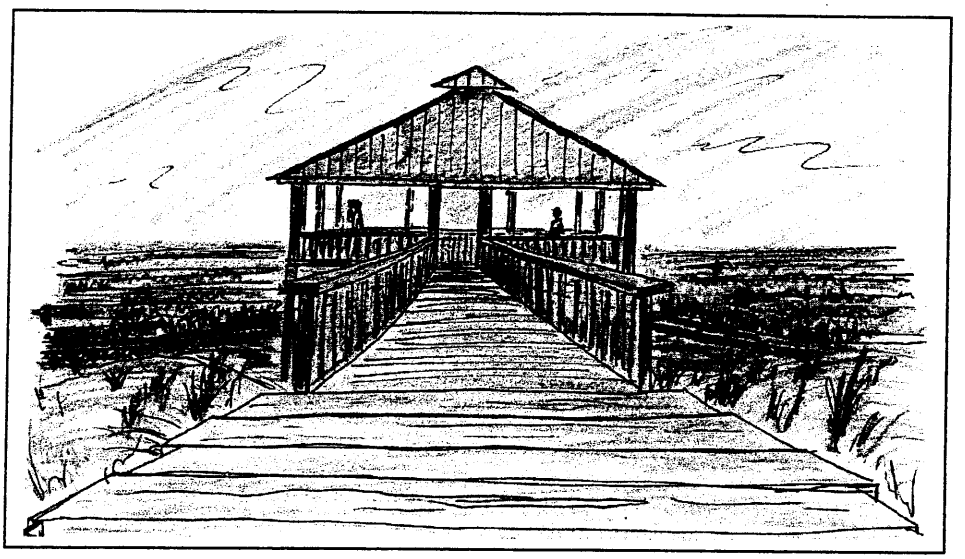

Figure 8: Entry to Elevated Observation Deck

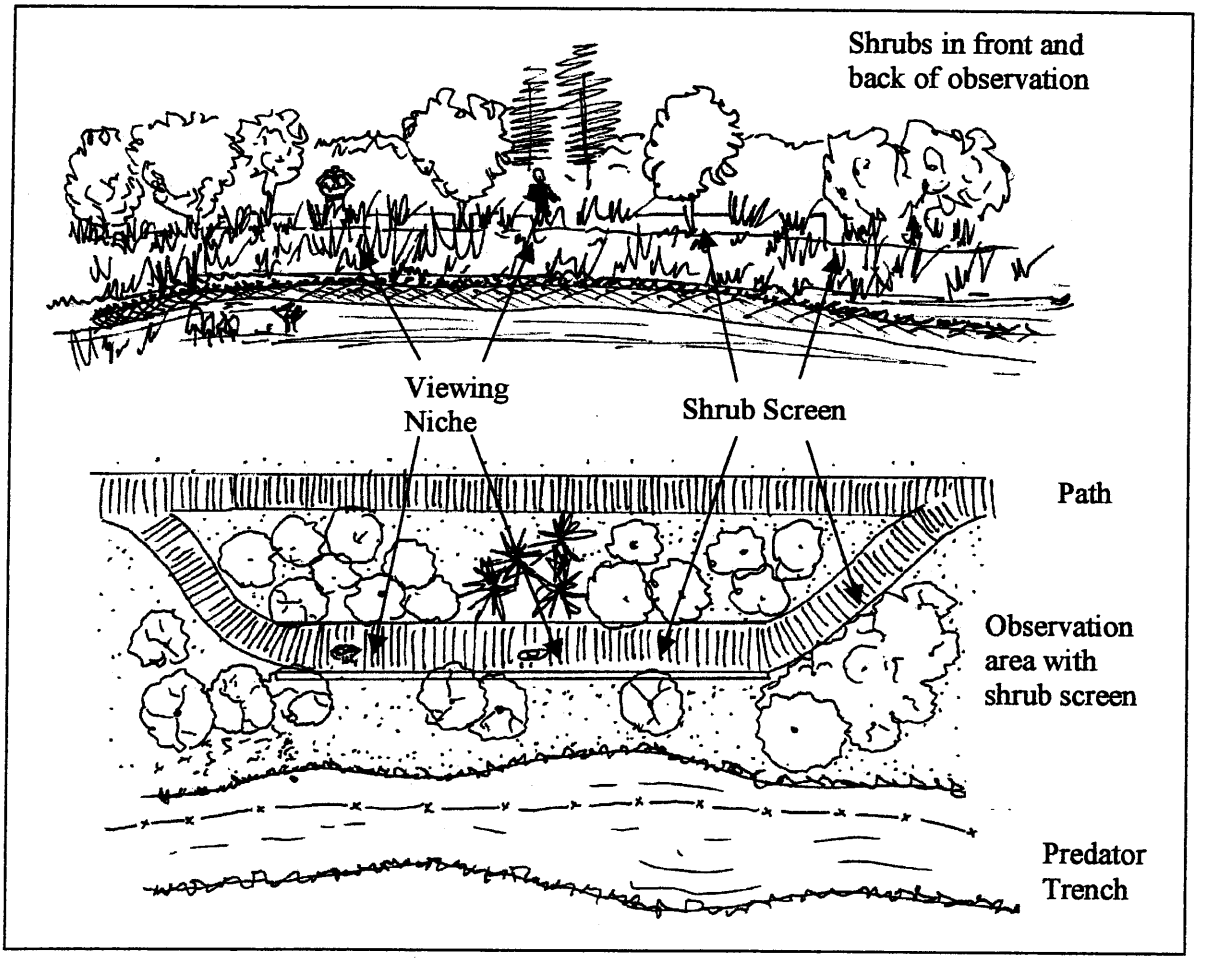

Figure 9: Shrub Screen Observation Area (not to scale)

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Planting plan

Open water and emergent vegetation

The deepest areas would be excavated to create standing water and emergent vegetation zones. It is expected that the water in this area would be freshwater with little salinity. The following mixture of freshwater species is recommended for planting in this area.

Common Name	Scientific Name
Freshwater Marsh species	
Arrowhead	*Sagittaria latifolia*
Bulltongue	*Sagittaria lancifolia*
Bushy Bluestem	*Andropogon glomeratus*
Fragrant Flatsedge	*Cyperus odoratus*
Fowl Manna Grass	Glyceria striata
Hardstem Bulrush	*Scirpus acutus*
Jamaican Sawgrass	*Cladium jamaicense*
Knotweed	*Polygonum spp.*
Roseau Cane	*Phragmites australis*
Soft-Stem Rush	*Juncus effusus*
Softstem Bulrush	Scirpus validus
Yellow Deer-Pea	*Vigna luteola*
Water Plantain	*Alisma subcordatum*

Grassland fringe

A grassland/herbaceous fringe should be established adjacent to the deepwater areas, in areas of saturated soils generally without standing water. The following is a suggested list of species to be established in this zone.

Goldenrod	*Solidago spp.*
Gulf Cordgrass	*Spartina spartinae*
Indiangrass	*Sorghastrum sp.*
Paspalum	*Paspalum spp.*
Pennywort	*Hydrocotyle spp.*
Prickly Pear	*Opuntia lindheimeri*
Rush	*Juncus spp.*
Saline Aster	*Aster subulatus*
Seacoast Bluestem	*Schizachyrium scoparium*
Spikerush	*Eleocharis spp.*
White-top Sedge	*Dichromena colorata*
Windmill Grass	*Chloris sp.*

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Upland dune communities

Common Name	Scientific Name
Beach Evening Primrose	*Oenothera drummondii*
Beach Morning Glory	*Ipomoea stolonifera*
Beach Tea	*Croton punctatus*
Coastal Dropseed	*Sporobolus virginicus*
Common Sunflower	*Helianthus spp.*
Fiddleleaf Morning Glory	*Ipomoea pes-caprae*
Marshhay Cordgrass	*Spartina patens*
Paspalum	*Paspalum spp.*
Rosy Marsh Mallow	*Kosteletzkya virginica*
Sea Oats	*Uniola paniculata*
Sea Ox-Eye	*Borrichia frutescens*
Seacoast Bluestem	*Schizachyrium scoparium*

Shrub plantings
A row of native shrubs with multiple openings shall be planted along the boardwalk along the western edge, to providing screening.

Sources of Plant Materials
Salvage of plants from the impacted site would provide an excellent source of plant materials. Species such as seaside goldenrod (*Solidago sempervirens*), marshhay cordgrass (*Spartina patens*), coastal water hyssop (*Bacopa monnieri*), seashore paspalum (*Paspalum vaginatum*, three square bulrush (*Scirpus pungens*), pennywort (*Hydrocotyle bonariensi)*, nutsedges (*Cyperus spp.*), torpedo grass (*Panicum repens*) and others are found at the impacted wetland. Other species could be added from seed mixes and or seedlings purchased from native plant nurseries. A list of native wetland plant nurseries may be obtained from the U.S.D.A website

Summary and Recommendations
The Kahala project site located south of FM 3005 on Galveston Island, Texas proposes filling 23.69 acres of coastal marsh for a TND development. As replacement for the proposed project, a mitigation site located to the northwest of the development has been proposed for 24-30 acres of wetland creation and/or restoration with remaining acreage restored to native sand/dune communities. The site consists of drained and degraded wetland as well as some upland scrub-shrub and grassland.

The proposed conceptual mitigation plans involve the creation of freshwater emergent vegeation with grassland fringe bordered by upland sand/dune communities. Large cells would be excavated and connected to the existing slough via overflow channels. The proposed plans would restore a variety of plant community types including open water and palustrine emergent wetland, prairie/grassland and scrub/shrub. Birding trails would be included in the plan to support passive recreation and wildlife viewing.

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